570
L75
v. 13

THE

THIRTEENTH ANNUAL REPORT

OF THE

LIVERPOOL MARINE BIOLOGY COMMITTEE,

AND THEIR

BIOLOGICAL STATION AT PORT ERIN,

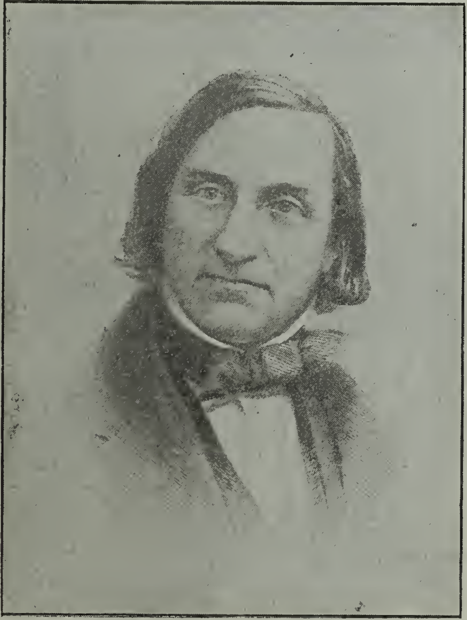
(ISLE OF MAN).

BY

W. A. HERDMAN, D.Sc., F.R.S.,
F.L.S., F.R.S.E.,

DERBY PROFESSOR OF NATURAL HISTORY IN UNIVERSITY COLLEGE, LIVERPOOL;
CHAIRMAN OF THE LIVERPOOL MARINE BIOLOGY COMMITTEE,
AND DIRECTOR OF THE PORT ERIN STATION.

[Read, in part, before the Liverpool Biological Society, 10th November, 1899.]



Professor EDWARD FORBES, 1815—1854.

PRINTED BY T. DOBB & Co., 229, BROWNLOW HILL, LIVERPOOL
December, 1899.

THE UNIVERSITY
OF ILLINOIS
LIBRARY

~~570~~.6
~~IL~~
~~v.13~~

THE

THIRTEENTH ANNUAL REPORT

OF THE

LIVERPOOL MARINE BIOLOGY COMMITTEE,

AND THEIR

BIOLOGICAL STATION AT PORT ERIN,

(ISLE OF MAN).

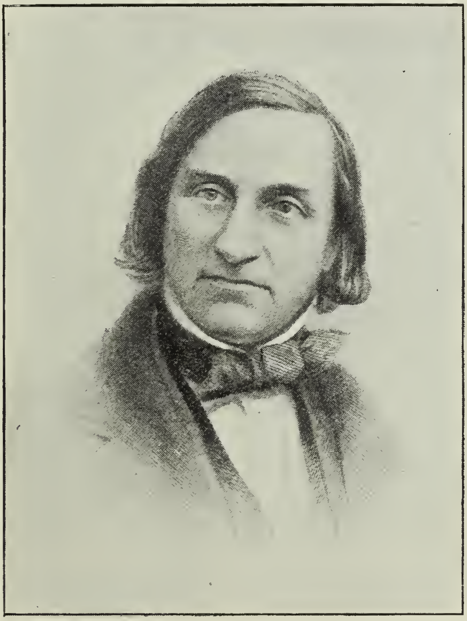
BY

W. A. HERDMAN, D.Sc., F.R.S.,
F.L.S., F.R.S.E.,

UNIVERSITY OF ILLINOIS LIBRARY
1916

DERBY PROFESSOR OF NATURAL HISTORY IN UNIVERSITY COLLEGE, LIVERPOOL;
CHAIRMAN OF THE LIVERPOOL MARINE BIOLOGY COMMITTEE,
AND DIRECTOR OF THE PORT ERIN STATION.

[Read, in part, before the Liverpool Biological Society, 10th November, 1899.]



Professor EDWARD FORBES, 1815—1854.

PRINTED BY T. DOBB & CO., 229, BROWNLOW HILL, LIVERPOOL

December, 1899.

"It is not the least of the results of the direction which the theory of natural selection has given to biologic study, that it has led the biologist back to his earlier methods, and bid him scrutinise with care the ways of living things, how they tell upon and are told upon by the world around them. The outcome of the deepest, most far-reaching biologic inquiry, has been the rehabilitation of the naturalist of old."

MICHAEL FOSTER.

570
L75
v.13

[FROM TRANSACTIONS LIVERPOOL BIOLOGICAL SOCIETY.]

THIRTEENTH ANNUAL REPORT of the LIVERPOOL MARINE BIOLOGY COMMITTEE and their BIOLOGICAL STATION at PORT ERIN.

By Professor W. A. HERDMAN, D.Sc., F.R.S.

The past year has been notable in several respects. In the amount and quality of the students' work at the Biological Station it is, I consider, the best year we have ever had; several new lines of investigation have been started; a new set of publications—the L.M.B.C. Memoirs—has been successfully launched, and we have renewed our tenancy of the buildings at Port Erin under new landlords. All these and other matters will be dealt with in order in the following pages. We may begin, as usual, with the formal statistics as to the occupation of the work tables at the Laboratory, and then pass to the Curator's report upon the events of the year at Port Erin. Work at Liverpool, the publications of the Committee, and wider considerations, such as the result of the Stockholm Conference on Marine Exploration, will close the Report.

THE STATION RECORD.

During the past year the following naturalists have worked at the Biological Station, in addition to the Curator (Mr. H. C. Chadwick) who has been in constant attendance with the exception of a fortnight's holiday in May.

DATE.	NAME.	WORK.
January.	Prof. W. A. Herdman	General.
—	Mr. I. C. Thompson	Copepoda.
March.	Miss Sollas, Newnham Coll., Cambridge	General.
—	Mr. H. S. Harrison, Univ. Coll., Cardiff	Hydrozoa.

339151

DATE.	NAME.	WORK.
March.	Mr. E. T. Townsend, Owens Coll. ...	General.
—	Prof. W. A. Herdman	General.
—	Mr. I. C. Thompson	Copepoda.
—	Mr. R. L. Ascroft	Fishes.
—	Mr. E. J. W. Harvey, Liverpool... ...	General.
April.	Mr. A. R. Jackson, Univ. Coll., Liverpool	Arachnida.
—	Mr. J. C. Mann, Univ. Coll.	General.
—	Mr. R. Kelly, Univ. Coll....	General.
—	Mr. F. J. Cole, Univ. Coll.	Comp. Ascidians.
May.	Mr. C. E. Jones, Univ. Coll.	Marine Algæ.
—	Mr. H. Yates, Manchester	Polychæta, &c.
June.	Mr. E. Schuster, New Coll., Oxford ...	Polychæta.
July.	Prof. W. A. Herdman	General.
—	Mr. I. C. Thompson	Copepoda.
—	Mr. E. Schuster	Polychæta.
—	Mr. J. T. Jenkins, Univ. Coll., Aberystwyth and Liverpool	Mollusca, Fishes, and Plankton.
August.	Mr. C. Crossland, Clare Coll., Cambridge	General.
—	Mr. J. T. Jenkins, Univ. Coll., Liverpool	Mollusca, Fishes, &c.
—	Mr. R. Simon, Manchester	General.
—	Mr. J. Corker, Manchester	General.
—	Mr. Buckley, Manchester	General.
—	Mr. D. R. Mackay, Manchester	Hydroida.
September.	Mr. J. T. Jenkins, Univ. Coll.	Mollusca, Fishes, &c.
—	Mr. C. Crossland, Clare Coll., Cambridge	General.
—	Mr. H. Yates, Manchester	Polychæta, &c.
October.	Mr. I. C. Thompson	Copepoda.
—	Mr. P. M. C. Kermode	General.
—	Prof. W. A. Herdman	General.
December.	Mr. I. C. Thompson	Official.
—	Prof. W. A. Herdman	Official.

This record shows an increase not merely in the number of individuals, but what is more important, in the length of time that each worker stayed, and, therefore, in the seriousness and extent of his work. The list, it will be noticed, includes students from Oxford, Cambridge, and the Welsh Colleges, in addition to those from the Colleges at Manchester and Liverpool which have secured work-tables at the Station.

THE CURATOR'S REPORT.

Mr. CHADWICK reports as follows:—

"The dissecting and compound microscopes provided early in the year have proved most useful. All the instruments and apparatus required by workers have been carefully used, and, with the exception of certain of the dredges, are in good condition. The small iron trawl, provided last year, has been frequently used, and its loss, together with the rope, towards the close of the season, was most unfortunate. The nets attached to the 'Agassiz' and shrimp trawls were repaired after the last steamboat dredging excursion, but renewal of both will probably be necessary ere long. All the smaller dredges are in serviceable condition. Mr. H. Yates, of Manchester, has kindly lent, for an indefinite period, a sliding microtome by Reichert, specially adapted for cutting sections of material imbedded in celloidin.

"The Shellbend boats, though in need of slight repair, are little the worse for the frequent use to which they have been put.

"The Library has been well used, and the additions to the stock of books, including a nearly complete set of the Journal of the Marine Biological Association, have considerably enhanced its value. Several zoologists have kindly continued to contribute copies of their papers, for the reception of which, and other additions, a third bookcase has been provided. Further donations from authors, and others, will be very welcome.

"A small beginning has been made with the formation of a collection of microscope slides, illustrating the local fauna, which it is hoped will be of constantly increasing value to future workers at the Station.

"The sale of living and preserved specimens has not assumed noteworthy proportions, but orders from various sources keep coming in, and a number of carefully preserved specimens have been supplied to colleges and private workers.

"The record of meteorological observations begun last year has been continued, and in view of the exceptionally stormy character of the winter months, and the equally exceptional amount of sunshine experienced during the summer, a record of the average temperature of the air and sea may not be without interest.

MONTH.	9-30 a.m. AIR.	3-30 p.m.	9-30 a.m. SEA.	3-30 p.m.
October, 1898 ...	54° F.	55°	55°	56°
November ...	48°	49°	51°	52°
December ...	48°	48°	50°	50°
January, 1899 ...	44°	45°	46·5°	47·5°
February ...	43°	46°	45°	47°
March ...	42·5°	45·5°	39°	47°
April ...	46·5°	49°	48·5°	50°
May ...	50·5°	54°	52°	54°
June ...	59°	65°	58°	61°
July ...	60°	61°	59·5°	60·5°
August ...	65°	65·5°	61·5°	60°
September ...	57°	59°	58·5°	60°

"The aquarium has not proved quite so attractive to visitors this year as last, only 310 persons having paid for admission. This is probably in large measure due to the exceptionally fine weather which prevailed throughout the summer, enabling visitors to Port Erin to spend most of their time in boating and other out-door amusements. Still, the interest shown by the visitors has been well maintained, and the preserved specimens on the shelves have been scarcely less attractive to many than the living occupants of the tanks. Cracks extending from top to bottom of the plate glass fronts of both wall tanks in the basement, appeared, one at the beginning of the winter and the other early in the present year; the result, most probably, of slight settlement of the building. Fortunately, they have not interfered with the usefulness of the tanks. Each still holds a depth of 18 inches of water without appreciable leakage.

"During the early part of March all the tanks were emptied, thoroughly cleansed and, where necessary, re-stocked. A considerable number of the animals introduced at Easter, 1898, survived the winter, but during the excessive heat experienced at the end of August, the mortality amongst them was great, and few now remain. A specimen of *Sabella pavonia*, placed in one of the shallow table tanks in July, 1898, is still (December, 1899), alive. Several Shannies (*Blennius pholis*) and a Sting-fish (*Cottus scorpius*) spawned in one of the tanks during the first week in March, but the eggs were not fertilised. The last named fish has well maintained its reputation for pugnacity and voracity by attacking and killing every fish that has been placed in the tank, with the exception of a young Dragonet (*Callionymus lyra*), which escaped the fate of three others placed in the tank at the same time, and still survives. I have several times seen the Sting-fish swallow so many young plaice that it could only with some effort raise itself from the bottom of the tank.

"A small lobster, about 3 inches long, was captured and placed in one of the wall tanks, about the middle of February, and it now appears to be thoroughly acclimatised. One morning in March I found the dead body of a Sting-fish, which had been in a sickly condition for several days, buried in the gravel at the bottom of the tank. On removing it I found that it had been partly eaten. A fortnight later a hermit crab was killed, and its body similarly buried. As the lobster was the only animal in the tank capable of doing this, I did not disturb it, and found, on the following morning, that it had been disturbed and re-buried. The next morning nothing remained but the chelæ and walking legs. The lobster has now established itself in a particular crevice in the rock-work, to which all food given to it is carried.

"In February I was fortunate enough to see a large number of ova extruded by a specimen of *Nereis pelagica.* I kept the worm in a small dish, and one day noticed that the parapodia on the left side of the ninth and tenth segments had become much swollen. On the next day the swelling had increased, and while watching the movements of the worm I saw the ova extruded from the swollen region, probably from the nephridiopores of the affected segments. I then fixed and preserved the worm, and it has since been photographed by Mr. E. Schuster, of New College, Oxford.

"In regard to Faunistic work, I have availed myself of every opportunity afforded by low tides to collect on the shores of Port Erin and the neighbouring bays, and thirteen dredging excursions have been undertaken in small boats. The courses dredged over, and the animals collected, were carefully recorded. The harbour buoy was brought ashore for its annual cleaning on August 11th this year, and again yielded over thirty species. Amongst them was an abnormal specimen of the Nudibranch, *Eolis glottensis* (?), in which the foot is divided into two quite distinct portions of exactly similar shape, one in front of the other. Amongst the additions to our lists are the Hydroid *Campanulina repens*, and the Nudibranch *Hermæa dendritica*, both discovered in 'Pat's Dub' by Miss Sollas.

"I have devoted some time during the past year to the study of the Polychæta of the bay, and have gained a good deal of knowledge of the habitats and times of occurrence of the different species. During the ensuing year it is my intention to devote special attention to some of the other less known groups, so that at its close, the detailed report on the shore and bottom fauna of the bay (illustrated by charts), which has been alluded to in former annual reports, may be completed and issued.

"Experiments with various reagents have been made from time to time, with a view of discovering new and improving old methods of narcotising and fixing marine animals. Menthol, recommended by Dr. H. C. Sorby, has proved very useful for Hydroida, Siphonophora, and Polyzoa. By dropping a few crystals on the surface of the water in a trough in which I examined *Agalmopsis elegans*, I was able to keep the specimens quite motionless and in a fully extended condition for some time. The usually refractory Sertularians give very good results. A 1 % solution of Cocaine has been used with complete success in narcotising the Lamellibranch, *Tapes pullastra*, with its siphons fully extended."

EASTER COLLECTING PARTY.

The usual dredging expedition of the Liverpool Marine Biology Committee in the Easter vacation opened very successfully, but was brought to a sad and untimely end on the third day by an unfortunate boat accident in Port Erin Bay. On March 31st dredging and trawling to the east of the Calf Island were carried on from the fisheries steamer "John Fell," and on the following forenoon the working of the "Tanner" closing net, and the method of pumping plankton from the bottom by means of a hose-pipe, were demonstrated to the Students on the steamer. On the afternoon of Saturday, April 1st, two of the workers at the Biological Station went out to collect surface plankton in the smaller station boat. While hauling in the tow-net, when returning, the boat capsized, and both men were thrown into the water. One of them (Mr. E. J. W. Harvey, of Liverpool) was picked up by the other boat from the Biological Station, but his companion (Mr. Eric T. Townsend, of Prestwich) was unfortunately drowned before assistance could reach him. The body was eventually recovered. Mr. Townsend was a student of the Owens' College, and was the occupant of the College work-table at the Biological Station for the Easter vacation. He was a promising Student, keenly interested in his biological work, and much esteemed by his fellow-workers. The party broke up after this sad occurrence. It is the first serious accident of any kind that has taken place on the L.M.B.C. expeditions or at their Biological Station during the fifteen years of work.

Notes on Work done at the Station.

A good deal of the Laboratory work this year has been not so much that of Specialists as of Advanced Students, which is not intended for publication, and in regard to which little that is of interest can be said. Two of the other workers, Mr. I. C. Thompson, F.L.S., and Mr. J. T. Jenkins, B.Sc., have given me special notes about Copepoda and Fishes, which will be inserted at the end of this section. Of those that remain :—Mr. A. R. Jackson, B.Sc., was engaged in adding to his list of Arachnids of the district, and met with some success; Mr. F. J. Cole continued his studies on the budding of Compound Ascidians, and collected and preserved much material for future work in Liverpool; and Mr. H. S. Harrison, B.Sc., has written me a letter telling of the Hydroid and Medusoid material that he collected, and ending with the following words :—" I hope some time to make a longer stay at Port Erin at a more favourable time of year, for at that time I felt that I had not a fair opportunity of doing justice to the splendid facilities for study and research offered by the fauna of the district. However, in spite of the shortness of my stay and the unfavourable weather, I found everything very instructive."

NEW COPEPODA.

Mr. THOMPSON has kindly drawn up the following note upon his work :—

" During the year I have regularly received for examination from our Curator, Mr. H. C. Chadwick, bottles of plankton material collected by him in and about Port Erin Bay. In addition to these, I have myself, on several visits to Port Erin, used the tow-net for collecting about the district. As Mr. Chadwick will discuss the other organisms noted in the collections, I will refer here only to the COPEPODA, which, however, usually form the chief proportion of the organisms in the tow-net.

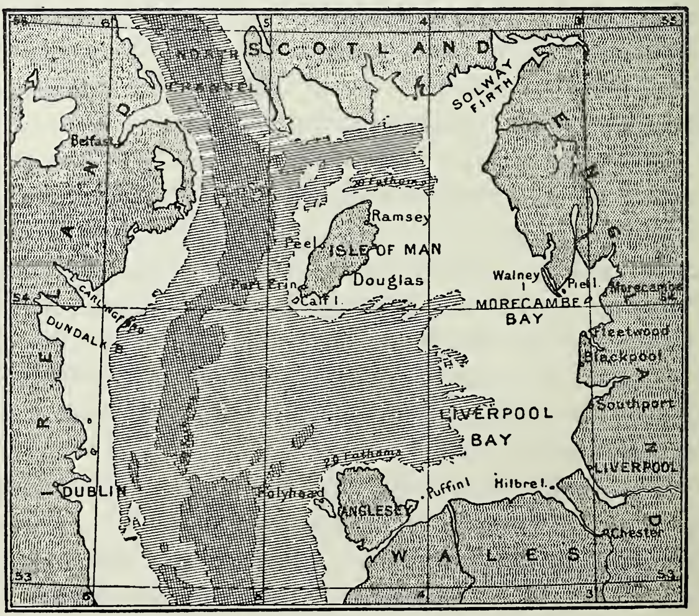
" The most notable feature of the year has been the appearance of two species of Copepoda new to the district, viz., *Candacia pectinata*, and *Corycæus anglicus*, each of which has been taken on several separate occasions. The former occurred during January, June, and July, and was taken both at or near the surface, and also at a depth of 33 fathoms. The latter species was taken during the early winter (Nov. 26th, 1898), and a shoal of it was also captured on May 29th.

" *Candacia pectinata* appears to be generally, but very sparingly, distributed about the British Isles. It was first found by Drs. Brady and Robertson, at a depth of 40 fathoms, off the Scilly Islands. I have on several occasions found it on the west coast of Scotland, and Mr. Thomas

Scott, F.L.S., reports it from the Frith of Forth. About the Channel Islands I have taken it sparingly, and more plentifully about Valencia in Ireland. Dr. Brady reports the "Challenger" captures of this species about Australia, the Phillipine Islands, and between Ascension and the Azores. I found it common about the Canary Islands, and have lately detected it in plankton taken near Madagascar, by Capt. Fred. Wyse, a record of whose collecting results I hope shortly to publish.

"This and the other species of the genus *Candacia* are easily distinguishable by their dark-coloured antennæ, spines and plumes, and the terminal spines of the swimming feet.

"*Corycæus anglicus* is fairly common about the south and south-west coasts of England and Ireland, but with the exception of its occasional appearance in the Forth,



Plan of the L.M.B.C. District.

as reported by Mr. Thomas Scott, it has, I believe, been hitherto unknown on our northerly coasts.

"During an inspection cruise of the spawning grounds off the west of the Isle of Man, on the fishery steamer "John Fell," in January last, when, by the kindness of Mr. Dawson, the Superintendent of the Lancashire Fishery District, some of the L.M.B.C. were invited to be present, some interesting observations were made as to the quantity and comparative character of the plankton collected under similar conditions at the surface and at the sea bottom. I have already recorded the results in a paper 'Notes on Mid-Winter Surface and Deep Tow-Nettings in the Irish Sea,' see L.B.S. Trans., vol. XIII., pp. 156—62. It is hoped that we may be able at other seasons of the year to continue observations on a similar plan.

"In addition to the forms noted above, Mr. Andrew Scott has found several other species of Copepoda new to our district and one, at least, new to science, during the past year in his work at the Piel Hatchery, on the Lancashire coast. These will be described in a joint paper by Mr. Scott and myself, which will be laid before the Biological Society, and published in the 'Transactions.'"

THE FISH OF PORT ERIN.

Mr. J. T. JENKINS, as the result of one part of his work at the Biological Station, has drawn up the following report upon:—"The Distribution of Fish in and around Port Erin Bay during August and September, 1899."

"The total number of species captured during these two months was 32. Taking the families in order, we get:—

SPARIDÆ. — *Pagellus centrodontus* (Sea Bream) was abundant outside the Bay, more especially to the north of Fleshwick. It was taken with mackerel bait a short distance off the ground.

COTTIDÆ.—Four species were captured. *Cottus scorpius* and *C. bubalis* (Bullheads) were taken in rock pools at low tide all round the Bay, from the breakwater to the north side. They may be taken either with a hand net or with a hook, using Littorina as bait. Young ones were also captured in the dredge; they are voracious feeders.

Trigla gurnardus (Grey Gurnard) are very common. They can be taken within the Bay and outside from the Calf to two or three miles north of Fleshwick. They are voracious feeders, will bite readily at Arenicola, herring or mackerel bait. *Trigla cuculus* (Red Gurnard) are not so common as *T. gurnardus*, but fairly abundant; distribution similar; some very large specimens were captured.

SCOMBRIDÆ.—*Scomber scomber* (Mackerel) is occasionally taken in the Bay. It is plentiful outside from Bradda Head to the Calf. It is taken with artificial bait, india rubber tubing with a piece of skin of a fish. Five dozen were taken in one afternoon (Sept. 12th) by "whiffing" with two lines from a yacht.

GOBIIDÆ.—*Gobius niger* (the Goby). Distribution as for the *Cottus* species. *Callionymus lyra* (Dragonet). Frequently taken in the dredge from Bradda Head to Bay Fine.

DISCOBOLI.—*Cyclopterus lumpus* (Lump Sucker). A single specimen was found adhering to the buoy.

Two species of *Lepadogaster* (Suckers) were obtained: viz., *L. gouanii* and *L. decandolii.* These were obtained in rock pools at low tide and also in the dredge within the Bay.

BLENNIIDÆ.—*Blennius pholis* (Shanny) is a littoral form; in rock pools between the Biological Station and Spaldrick Bay at low tide. Also, along with it, *Centronotus gunnellus* (Butter fish), taken in rock pools throughout the Bay.

GASTEROSTEIDÆ. — *Gasterosteus spinachia* (15 spined Stickleback) is a littoral form; distribution as for the last species.

LABRIDÆ.—*Labrus mixtus* (Cook Wrasse) is abundant round the breakwater, and was occasionally taken off Bradda Head and in Bay Fine.

GADIDÆ.—A large number of young forms of various species of *Gadus* are found around the breakwater.

Gadus virens (Saithe): young taken in the dredge within the Bay. *Gadus pollachius* (Pollack) is abundant: taken within the Bay near the buoy; also taken outside frequently from north of Fleshwick to Halfway rock. *Gadus morrhua* (Cod) and *Gadus æglefinus* (Haddock): generally taken a few miles outside the Bay.

Molva vulgaris (Ling) is taken to south of Port Erin (Bay Fine and off the Calf). *Merluccius vulgaris* (Hake): distribution as for *G. morrhua*. *Motella mustela* and *M. tricirrata* (Rocklings) are taken in the vicinity of the breakwater.

OPHIDIIDÆ.—One species only, *Ammodytes tobianus* (Lesser Sand Eel). This is taken at low tide in pools on the south side of the Bay near the landing stage.

PLEURONECTIDÆ.—I only succeeded in capturing two species of flat fish—*Pleuronectes platessa* (Plaice) and *P. limanda* (Dab). I should be inclined to think that other Pleuronectids are common. Both species mentioned were taken frequently in the Bay and outside the Bay from the breakwater to Halfway rock. Young forms were frequently taken in the dredge, both inside and outside the Bay. On Aug. 21st, a shoal of young Pleuronectids were observed at low water opposite the Laboratory.

SCOMBRESOCIDÆ.—*Belone vulgaris* (Garfish) is taken when "whiffing" for mackerel. Probably accompanies mackerel shoals.

CLUPEIDÆ.—*Clupea harengus* (Herring) is taken abundantly a few miles south-west of the Calf.

MURÆNIDÆ.—*Conger vulgaris* (Conger Eel) is taken outside the Bay from north of Fleshwick to the Calf. Evidently prefers mackerel to any other form of bait, and undoubtedly selects it in preference to herring.

SYNGNATHIDÆ.—*Syngnathus acus* (Pipe fish) is captured at low tide and in rock pools. Seems to prefer neighbourhood of *Chorda filum*, to detached or floating portions of which it presents some resemblance.

ELASMOBRANCHII.—*Raja maculata* (Skate) and *Scyllium canicula* (Dog fish) were taken outside the Bay when ground fishing with mackerel bait for other forms."

WORK ON OYSTERS AND DISEASE.

As the progress of the investigation upon the conditions under which oysters flourish, and the connection between unhealthy oysters and disease in man, carried on for some years now by Prof. Boyce and myself, has been noted from time to time in these Annual Reports, it may interest some readers to know that the work is now concluded, and that the final results have been published (October, 1899) under the auspices of the Lancashire Sea-Fisheries Committee, as the first "Lancashire Sea-Fisheries Memoir." This is a thin quarto volume* of about 70 pages, illustrated by eight partly coloured plates, and giving the details of the histological, chemical, and bacteriological evidence upon which the conclusions as to oysters printed in last year's report were based. Since that report was published last year it is satisfactory to know that (1) the "British Oyster Industries Association," on very much the lines that we suggested, has been formed, and (2) an Oyster Bill has been laid before Parliament and referred to a Select Committee of the House of Lords. The Bill, although capable of improvement in some details, does much to meet the present difficulties; if, however, the Oyster Association takes a sufficiently high view of its responsibilities and duties, the provisions of the Bill may become unnecessary.

---

* "Oysters and Disease," published by George Philip and Son, London and Liverpool, at 7s. 6d. nett.

I may, finally, give here a few sentences of the practical conclusions at which Prof. Boyce and I have arrived as the result of the bacteriological work:—

"It is evident from the result of these experiments, and a consideration of all the facts brought to light in recent years in regard to the bacteriology of shell-fish and its influence on public health, that we must regard oysters, mussels, cockles, and the like as nutritious food matters which, from their nature and the circumstances of their cultivation and sale, are liable to become contaminated with organisms—pathogenic or otherwise—and their deleterious products.

"Once this is recognised, the practical applications are largely a matter of common sense. Shell-fish must not be taken as food from grounds where there is any possibility of sewage contamination; after removal from the sea, while in transit, in store, or in market, they should be carefully protected from any possibility of insanitary environment; they should not be kept longer than is absolutely necessary in shops, cellars, &c., in towns, where, even if not running the risk of fresh contamination, they are under conditions favourable to the reduction of their vitality, and the growth of their bacterial contents—the fresher they are from the sea the more healthy they are likely to be. Finally, only absolutely fresh shell-fish should be eaten uncooked, and those that are cooked must be *sufficiently cooked*, raised to boiling point, and kept there at least ten minutes."

International Exploration of the Sea, and the Stockholm Conference.

In our last Report the further exploration of the North Atlantic and the Arctic Seas, in the interests both of fisheries work and of scientific investigation, was discussed at some length, and suggestions were made as to the lines along which series of observations were highly desirable. This matter has been before the minds of scientific men both in this country and abroad for some years now, and many biologists would, no doubt, gladly do the work if the necessary observing vessels were provided by the European governments concerned in the coast fisheries. When it was announced, early in 1899, that our government had accepted the invitation from the Swedish government to take part in an International Conference on the whole subject, to be held at Stockholm during the summer, hope ran high that at last the opportunity had come when strong representations would be made to the governments of north-western Europe, such as would lead to the provision of the required boats and men for a number of years sufficient to carry out the biological investigation of the seas around the British Isles.

The Conference was held at Stockholm in the latter part of June, and a great deal of the credit of having brought the matter to that point must be given to the Secretary of the Swedish Committee, Dr. Otto Pettersson, the distinguished Hydrographic expert. The Hydrographic element was probably very strong amongst the delegates present, and certainly seems to be the dominant note in the published account of the deliberations. Probably, that is the reason why the official Report*, now published, is a somewhat disappointing document in the eyes of biologists. It consists of a number of resolutions in regard to what is desirable, or what is required in the investigation of the sea, and of one recommendation as to the formation of a central bureau to control the work and conduct a laboratory.

One section is called a "Programme" of work, but there is no practical programme of biological work—laying down how, when and where the investigations are to be carried out—such as was expected, and is required. For, surely, what we need most at the present time, in the interests of more exact fisheries† knowledge, is the nearest possible approximation to a "census" of our seas, beginning with the territorial waters. Most fisheries disputes and differences of opinion are due to the absence of such exact knowledge. If such an approximate census, or record of really reliable statistics, had been taken fifty years ago it would now be invaluable to fisheries inspectors, superintendents and local authorities, as well as to biologists. Our descendants will justly reproach us if, with our increased knowledge and opportunity, we let the twentieth century commence without inaugurating some such system of statistics.

The Report of the Conference says nothing of all this. In place of asking for boats and men, it expresses many admirable sentiments and pious wishes as to what is desirable and what should be done—sentiments and wishes that are quite unexceptionable, but which have been before the public now for some years, and which are in the main agreed to on all hands. We looked for something more from this Conference. Their one definite recommendation (see "Résolutions Textuelles," p. 12) to the governments concerned, is in regard to the establishment of the central bureau, in which the work will apparently, in large part, be that of a physico-chemical laboratory. I do not think that, after what I have written in previous L.M.B.C. Reports, I can be accused of under-valuing the importance of hydrographic work, in its connection with the fisheries, as carried out of late years chiefly by the Scandinavians; but it seems curious, to say the least of it, that the obvious biological investigations of primary importance have been passed so lightly over, while the secondary hydrographic investigations are strongly urged. The impression given by the Report is, certainly, that it has been drawn up by hydrographers, and not by biologists.

---

* "Conférence Internationale pour l'Exploration de la Mer, réunie à Stockholm, 1899."

† The British Government, we are told, only joined in the Conference in the interests of the fisheries applications of marine exploration.

There are points of detail in the report that might be criticised if it were worth while—such as that the sea-area, proposed by the Conference, to be covered by the hydrographic investigations should certainly be extended so as to include the English Channel and the Irish Sea—and probably, also, the west coast of Ireland. At any rate, the omission of the whole of the Irish Sea from a scheme undertaken (so far as our government delegates were concerned) in the interests of the British fisheries requires explanation.

It has been pointed out, by another critic, that the best course for the British government to pursue, in order to give effect to the report of the Stockholm Conference, is to develop, and, as far as possible, co-ordinate the work of the various institutions already in existence, such as the Marine Biological Association and the Scottish Fishery Board, at the same time encouraging the formation of local laboratories at various points around the coast, such as those of the Liverpool Committee (at Port Erin), of the Lancashire Sea-Fisheries (at Piel), and of the Northumberland Committee (at Cullercoats). In place of any such scheme of biological collaboration between existing marine stations, the report of the Conference urges the institution of the new central bureau and laboratory—an elaborate and expensive organisation, which will probably appear to most biologists a matter of quite secondary importance, against which objections may be made. The following one has already been raised*:—"With an elaborate organisation, such as that suggested by the Conference, there is a danger that the work of the biological stations would degenerate into the mere taking and recording of routine observations, whilst original work and the development of new methods of research, which are in reality of far greater importance, would receive a check. Good men would certainly not be attracted to work which consisted merely in recording observations taken according to a stereotyped plan dictated by a central bureau. A large amount of individual freedom to the workers is absolutely essential in order to secure the best results from scientific research."

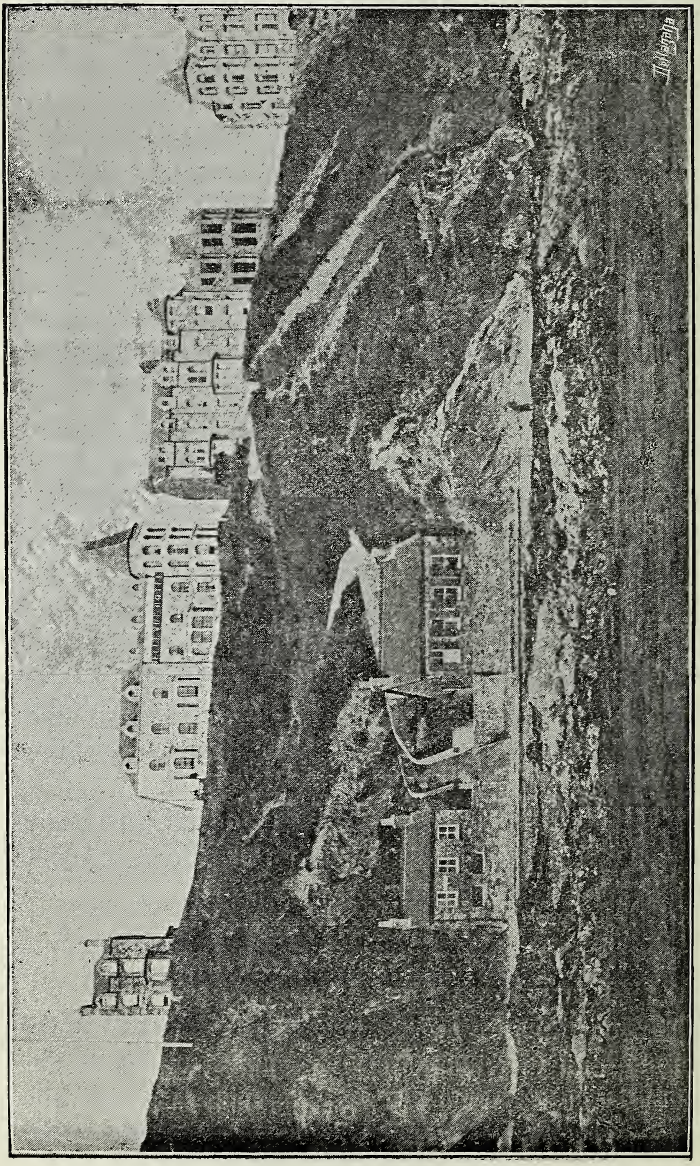
In my opinion, what we want at the present time is not conferences or committees, or a central bureau, so much as boats, men, and *work at sea.*

THE FUTURE OF THE BIOLOGICAL STATION.

Since last Report the Bellevue Hotel (and with it the Biological Station, built on the grounds of the hotel), like so many other hotels in the Isle of Man, has passed into the hands of a syndicate. After some negotiations, the

---

* "Nature," Nov. 16th, 1899.



Port Erin Biological Station and its surroundings, at low tide, from the sea. [From a photo by Rev. T. S. Lea.]

Committee have arranged to continue their tenancy of the buildings: so our landlord is no longer Mr. Thomas Clague, but a Company.

We have no desire to make a change at present, but we feel that the question of expansion will have to be faced soon. We have the doubtful advantage of being, perhaps, the smallest Biological Station (so far as regards buildings) in the world, our space is much cramped, each year we are, at holiday times, over-crowded with workers, and there are many additions and improvements in laboratory and aquarium that are badly wanted. Our last Annual Report was most favourably commented upon in an editorial review in the well-known journal "Natural Science," and the article ended with the following sentences* :—

> "We cannot, indeed, but regard it as remarkable "that a wealthy city like Liverpool, with all its "traditions as a sea-port, should be unable to offer "its Marine Station more than the very small sum "at present at its disposal. If successful and per- "severing work with small means deserves encour- "agement, it certainly should not be lacking to the "Port Erin Station. We wish Professor Herdman "and his colleagues all success in the carrying out of "their enlarged conception of local research."

We thank our unknown friend, and hope that his view of the matter may be adopted by the citizens of Liverpool.

But we do not ask merely for money to enable us to carry on more work. We want more than material support. We wish to have the moral support afforded by knowing that we are of use to the community. At present we educate (in the laboratory) a small number of Science and Medical Students: we should like to educate all kinds of students. We do, in a sense, through the aquarium convey information to all visitors who enter the building, and through our Reports to all who read them. But much more use might be made of our institution, even on its present small scale, and there is scarcely a limit to the uses to which it might be put if re-built on a larger scale and adequately equipped. When one thinks of the *hundreds* of school teachers and students of arts and theology who, in America, flock to the Marine Biological Stations during the summer vacation, in order that they may have the opportunity of becoming acquainted with biological thoughts and methods, and of studying under expert guidance the facts and ways of living Nature, one cannot but be struck by the contrast here; and one is led to wonder how long it will be before the elements of nature-knowledge are recognised as an essential part of a liberal education.

---

* "Natural Science" for March, 1899, p. 186.

It is evident to some of us, from experience of and conversations with school teachers, that the demand for vacation work at Biological Stations is with us—it is the means of satisfying the demand that is absent. The immense success of the movement in America (*e.g.*, at the Woods Holl Biological Station, Massachusetts) not only justifies but requires us to urge its adoption here. If any Technical Instruction Committee, or other educational body (or individual), will build me a new biological station from my plans, within reasonable distance of Liverpool, and containing a laboratory in which, say 30, students can carry on work, I will undertake to admit school teachers free, and teach them in a free vacation class, and I feel sure, from some experience I have had, that the room would always be full, and that the students would find they were spending not merely an instructive, but also a most enjoyable vacation—learning new things every day, but in a manner so different from their ordinary school life that it would be a rest and a mental refreshment.

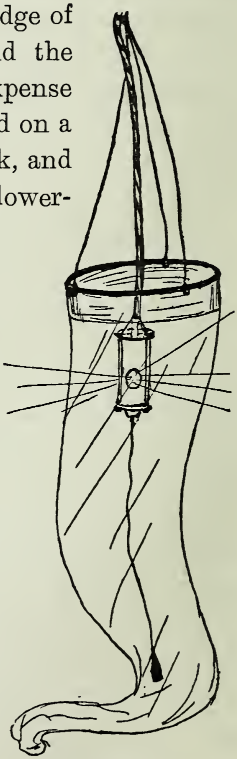
The importance of studying living Nature, and the uses that ought to be made of Biological Stations in education, are rapidly coming to be recognised in many other parts of the world. Here these institutions are not yet recognised as university laboratories, and time spent in them does not count in the curriculum for degrees. But in far Japan, Professor Mitsukuri tells me all the Biological Students of Tokio University are required to spend *at least* one season at the Marine Station of Misaki, which is a recognised institution of the University, while those who propose to graduate in Biology must spend a considerably longer period in such work. Many of the American Universities have Biological Stations as a necessary part of their equipment; and, in some cases, professors, staff, and students regularly migrate for the summer term to the sea-side laboratory.

Although England led the way in the past in Marine Biology, we are now behind other countries in the facilities and arrangements which cannot be provided by private enterprise. But all these things will come in time. We shall have University Biological Stations and Municipal Biological Stations some day. The pity is that we cannot have them *now* instead of 10, 20, or 30 years hence. Sir Michael Foster, in a recent address, has said:—"It is a matter of regret that the enthusiasm of the young learner should be spent wholly on the museum and the laboratory, that he should be pushed by compulsion and drawn by rewards into morphological and physiological studies of the more formal and mechanical kind, while no encouragement is given to him to look Nature face to face in the field, and to catch direct from her lips the Catholic teaching which she alone can give."

PLANKTON.

It was shown in last year's Report that one of the most important things the Biologist can do to add to our knowledge of life in the sea, with a practical view to the explanation of the movements and distribution of fish, is to make a systematic survey of the microscopic floating and drifting life of the sea, and its relation on the one hand to the physical conditions at the time (especially the temperature and salinity of the water), and on the other to the food materials found in the stomachs of the fish.

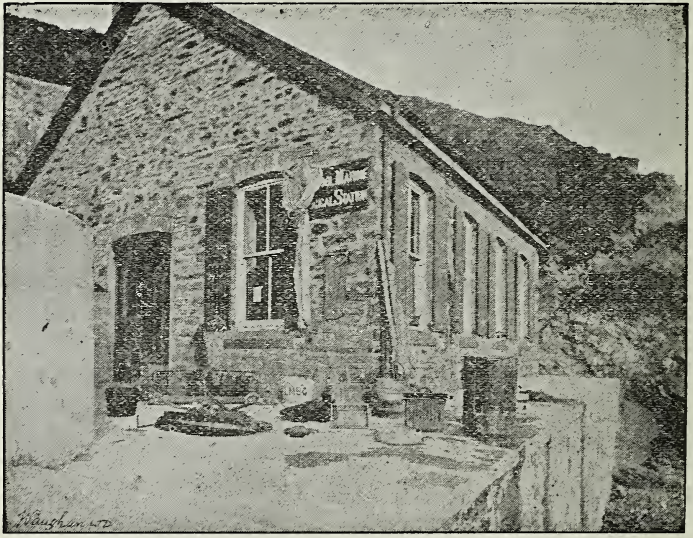
We have continued our efforts during the past year to contribute our share towards a knowledge of this "plankton" life of the sea round the British coasts. At some considerable expense we purchased a small hand pump, fitted on a stand for convenience of work on deck, and 20 fathoms of india-rubber hose-pipe for lowering to the bottom. This apparatus was used on several occasions early in the year, with rather disappointing results. It may be the more exact method in so far that it only gives organisms from the definite depth to which the end of the hose-pipe is lowered, while an ordinary open tow-net, lowered to the depth in question and raised again, may show some small admixture of organisms from the water above; but, on the other hand, the open tow-net catches far more material, and therefore gives a more complete knowledge of the fauna.



A Tow-Net.

There is a tendency, in trying to attain to more exact methods in biology, towards arguing and collecting, as if organisms were evenly distributed through the particular layer of water or region they inhabit—as if, in fact, they were like the salts dissolved in the water, so that one sample from a locality ought to be exactly like any other sample. This is far from being the case. One gallon or cubic foot of water, though, in the main, like its neighbours, may contain one of the rarer organisms not present in the next gallon examined. Consequently, in a net hauled up vertically, or in a comparatively small volume of water drawn up from a special layer through the hose-pipe, there is considerable risk of missing some of the less frequent organisms; while the ordinary tow-net, through which a very much greater mass of water passes, will probably contain a more completely representative gathering. This is, in the main, our objection to the pump-plankton method which we tried at Port Erin at Easter on board the fisheries steamer "John Fell." Equal times of working with the ordinary open tow-net and with the pump and hose gave results, both at bottom and at surface, which were absurdly disproportionate. The open tow-net collected in the same period many times as much material, and far more species than the pump showed.

Mr. Thompson, in his note on a previous page as to Copepoda, has referred to the interesting differences we found between surface and bottom (30 fathoms) plankton in mid-winter. We hope to continue such observations in the deeper water lying between the Isle of Man and Ireland. That, however, can only be done on our comparatively rare steamboat expeditions. In the meantime our Curator at the Station has endeavoured, during the whole of the past year, to take at least one ordinary surface tow-net gathering across Port Erin Bay in the week. Of course, such a scheme is dependent to some extent upon weather, and cannot always be carried out with absolute regularity. A few weeks have been missed now and then when it was practically impossible to work from a small boat in the Bay; but in all about thirty gatherings are fairly equally spread over the year, and every month is represented.



Apparatus brought back from a dredging expedition.

Mr. Chadwick has examined all these gatherings in the fresh condition, and they have then, after preservation, been carefully investigated by Mr. Thompson for Copepoda, while Mr. E. T. Browne, a former worker at Port Erin, has kindly identified the Medusæ sent to him. Mr. Chadwick has compiled MS. lists of all the gatherings, and has compared and summarised these with the object of ascertaining how far they bear out, correct, or supplement the conclusions we gave in a previous Report (No. XI., p. 17). The following summary of the results obtained from the examination of the past year's plankton, at Port Erin, has been drawn up by Mr. Chadwick for this Report. Mr. Chadwick has also provided us with the two carefully drawn plates which illustrate this section of the Report, and represent some of the more interesting larval forms captured during the year.

Summary of Port Erin Plankton in 1899.

The following summary is the result of careful examination of the series of tow-nettings taken in Port Erin Bay during the year 1899. It has not been possible to identify all the organisms taken, nor yet, in some few cases, to refer them to their respective classes, and this is especially the case with some of the larval forms. All the organisms taken during an hour's tow-netting were examined alive, under a low power, immediately after capture, and the figures on Plates I. and II., with which these notes are illustrated, were drawn from living specimens under appropriate magnification.

The occurrence of *Pelagia perla*, *Gattiola finmarchica*, *Autolytus incertus*, and the larvæ of *Phoronis* and *Balanoglossus* in Port Erin Bay is here recorded for the first time. With reference to the Medusæ, Mr. E. T. Browne writes :—"The occurrence at Port Erin of *Pelagia*, *Mitrocomella*, *Melicertidium*, and *Laodice* tends to show that you have had a northerly current this summer, bringing down animals through the north channel from the Atlantic shores of Ireland and Scotland." We hope to publish a more complete account of the times of occurrence and distribution of the Medusæ at a future time.

As an example of what may be looked for in a summer tow-netting across Port Erin Bay, the following list of organisms, taken on June 22nd, will be interesting. The time was 9-45 to 11-30 a.m.; temperature of sea, 59°; wind, E.S.E.; light, sky overcast.

Diatoms, many.
Ceratium tripos, few.
Phialidium cymbaloideum, many.
P. temporarium, many.
Sarsia tubulosa, several.
Margelis bella, few.
Mitrocomella polydiadema, several.
Aurelia aurita, many.
Hormiphora, many.
Pleurobrachia, many.
Asterid larvæ, few.
Echinoid plutei, several.
Ophiuroid plutei, many.
Pilidium larva, several.
Mitraria larva, several.
Tornaria larva, several (figs. 7, 9, 10, Pl. II.).
Trochophores, several.
Post-larval stage of *Polygordius* (?), few.
Post-larval stage of *Pectinaria*, few.
Post-larval stage of *Amphitrite* (?), several.
Post-larval stage of Polynoe, few.
Cyphonautes larva, many.
Actinotrocha larva of *Phoronis*, several.
Nauplii, very few.
Evadne nordmanni, numerous.
Podon intermedium, many.
Calanus finmarchicus, numerous.
Pseudocalanus elongatus, numerous.
Temora longicornis, many.
Centropages hamatus, few.
Acartia clausii, numerous.
Oithona spinifrons, few.

Candacia pectinata, few.
Zoeæ, many.
Oikopleura, few.

A few notes on the prevalent forms in the different months will now be given.

In the only tow-netting taken in January, the most notable forms were a Radiolarian (*Acanthometra*), of which there were many; the Hydromedusa *Hybocodon prolifer*, which, curiously enough, has not again been noted during the year; a Holothurian larva (fig. 1, Pl. II.), and the three stages of the development of an Asterid larva, figured on the same plate (figs. 4 to 6).

There were also several trochophore and post-larval stages of Polychæta, and single specimens of *Tomopteris onisciformis* and *Autolytus cornutus*. *Sagitta*, recorded in the Eleventh Annual Report as abundant in January, was not seen. There were a few Molluscan veligers and several specimens of *Oikopleura*. Lastly, a single specimen of the curious larva represented on Pl. I. (fig. 5), was seen, and kept under observation for some time.

In the February tow-nettings the Acanthometrids were well represented, and the Hydromedusæ *Obelia* and the first stage, with four tentacles, of *Phialidium temporarium*, appeared. Bipinnaria and Auricularia larvæ were in force, and a few Echinoid plutei, of two species, were noted. *Sagitta*, the larva of a Bopyrid, Nauplii, and Zoeæ appeared in increasing numbers as the end of the month drew near. Fish eggs appeared in small numbers on February 3rd, and fish larvæ, of two species, were taken on the 23rd.

A tow-netting, taken on March 13th, showed the Radiolarians to be present in diminishing numbers. Several very young specimens of *Hormiphora* appeared, and many Echinoid plutei, of three species, along with small numbers of Auricularia and Bipinnaria larvæ, and segmenting eggs of *Asterina gibbosa*, were seen. One specimen of *Autolytus incertus* was noted. On March 24th Cirripede nauplii were present in such large numbers that the water in the shore pools appeared to be muddy, and the quantity of Diatoms and other Algæ reached its maximum about the same date.

On April 14th two specimens of a minute Planarian worm (Plate I., fig. 1), and a single specimen of the larva of *Loxosoma*, were noted. Post-larval stages of Polychæta (Pl. I., figs. 7 and 8), and nauplii of Cirripedia and Copepoda were very numerous. A general increase in numbers was noted on the 27th, and the Hydromedusæ *Saphenia mirabilis* and *Phialidium cymbaloideum* appeared.

On May 23rd a Diatom *(Rhizosolenia)* was present in enormous numbers. On the 29th the Medusæ *Phialidium temporarium*, *P. cymbaloideum*, *Laodice calcarata*, *Sarsia tubulosa*, and *Pilema octopus*, and the Siphonophore *Agalmopsis elegans* were all represented, as also was the interesting larva of *Cerianthus* known as *Arachnactis bournei*. On the same date *Autolytus cornutus* was represented by half-a-dozen specimens, and the post-larval stage of *Pectinaria* was noted for the first time this year. *Sagitta*, represented by a few specimens on the 23rd, was fairly common on the 29th. On the latter date Nauplii of several species were still abundant, and several Megalopas were noted. *Oikopleura* was common.

On June 1st the Hydromedusæ, especially *Phialidium temporarium*, and the Siphonophore *Agalmopsis elegans* were more numerous, and *Pleurobrachia* appeared in great force. *Sagitta* and *Tomopteris* were common. Post-larval stages of Polychæta and Nauplii had almost disappeared, while Zoeæ of several species were tolerably common. On this date the Actinotrocha larva of *Phoronis*, one of the most interesting additions to our lists, was seen for the first time. Fish eggs and larvæ were still present in small numbers. Echinoid plutei of two, possibly three, species were present in large numbers in a tow-netting taken shortly before sunset on June 5th, and during the following week Ophiuroid plutei became almost equally numerous. Auricularia and Bipinnaria larvæ reappeared in small numbers. In addition to the Medusæ previously recorded, *Margelis bella*, *Euchilota pilosella*, and *Aurelia aurita* were present in fair numbers, and the medusa of *Corymorpha nutans* and the Actinula larva of *Tubularia* were represented by several specimens of each. *Sagitta* was common, as also was the post-larval stage of *Pectinaria*. *Evadne nordmanni* and *Podon intermedium* were found in increasing numbers in every tow-netting taken during this month. The number of larval forms reached its maximum during the last week in June.

The tow-nettings taken in the early part of July were similar to those of the latter end of June, the only addition to the organisms then recorded being the post-larval stage of *Chætopterus variopedatus*. On July 16th and during the following week *Aurelia aurita* and *Beroe ovata* were present in the Bay in enormous numbers, and *Tiara pileata* was common at the surface during the calm evenings of the following week. A species of *Cyanea* also occurred sparingly at this time.

During the early part of August several of the Hydromedusæ disappeared from the tow-nettings, while *Melicertidium octocostatum* was noted for the first time on the 11th. A species of *Obelia* was then common, and *Agalmopsis elegans* was still represented. Amongst a few Echinoid plutei that of *Echinocyamus pusillus* was noted. On the 19th Ophiuroid plutei were again numerous, and on the 22nd the Zoea and later larval stages of Macrura and Brachyura reached their maximum in numbers.

The early part of September brought unsettled weather, and with it a general diminution in the number of organisms present in the tow-nettings. With the exception of Nauplii, very few larval forms were seen. On the 15th a single specimen of the free-swimming Polychæte, *Gattiola finmarchica*, was taken. *Oikopleura* attained its maximum numbers at the end of this month.

Early in October large numbers of *Pelagia perla* appeared in the Bay, and with them *Pleurobrachia* and *Hormiphora* reappeared, as also did the Radiolarians noted in January and February. *Sagitta* and *Oikopleura* were again common on the 18th. Two specimens of the trochophore represented on Plate I. (fig. 2) were seen on the 28th, when post-larval stages of two Polychætes were common. Molluscan veligers and Lamellibranch fry were present in small numbers on the same date.

The November tow-nettings revealed a marked increase in the numbers of Diatoms and Molluscan and Tunicate larvæ. The gastrulating blastospheres represented on Plate II. (figs. 2 and 3) appeared towards the end of the month, as did two stages of the Holothurian larva (fig. 1).

In December the gastrulating blastospheres just mentioned increased in numbers, but no further stages of their development were seen; and the Holothurian larva again occurred. *Sagitta* was represented on the 17th and 30th by two or three specimens. Several specimens of the trochophore represented on Plate I. (fig. 3) were noted on the latter date. Post-larval stages of four species of Polychæta had each a few representatives.

Comparison of the foregoing summary with that contained in the Eleventh Annual Report, already cited, shows that, in the main, the various organisms appear and disappear about the same times year after year.

Finally, we print a complete list of the organisms found in the tow-nettings in 1899, with the times at which they occurred.

Diatoms, throughout the year.
Ceratium tripos, *C. fusus*, and *C. furca* throughout the year.
Tintinnus, September to December.
Codonella, November.
Dictyocysta, December.
Radiolarians, October to March.
Actinula larva of *Tubularia*, June.
Phialidium temporarium, January and May to August.
P. cymbaloideum, May, June, and July.
Hybocodon prolifer, January.
Sarsia tubulosa, May to August.
Obelia, February to November.
Corymorpha nutans, June and July.
Mitrocomella polydiadema, June and July.
Margelis bella, May to July.
Tiara pileata, July, August, and December.
Saphenia mirabilis, April.
Euchilota pilosella, June to August.
Laodice calcarata, May.
Melicertidium octocostatum, August.
Aurelia aurita, June to August.
Pelagia perla, October.
Pilema octopus, March, May, and October.
Cyanea, July and August.
Agalmopsis elegans, May to August.
Hormiphora, March to November.
Pleurobrachia, June to October.
Beroe ovata, July and August.
Arachnactis bournei, May and June.
Gastrulating blastospheres, probably Asterid, November to March and June.

Bipinnaria and Auricularia larvæ, Feb., Mar., & June.
Echinoid plutei, January, March, June to December.
Pluteus of *Echinocyamus pusillus*, August.
Ophiuroid plutei, February, March, June to Sept.
Holothurian larvæ, January, August, Nov., and Dec.
Pilidium larva, June.
Mitraria larva, June and November.
Tornaria larva, June and July.
Planarian worm, March and April.
Sagitta bipunctata, throughout the year.
Trochophore larvæ, February, June, Nov. to Dec.
Post-larval stages of Polychæta, throughout the year.
Post-larval stage of Polynoe, June to September.
Post-larval stage of *Chætopterus variopedatus*, July.
Post-larval stage of *Pectinaria*, May to July.
Post-larval stage of (?) *Amphitrite*, June and July.
Autolytus cornutus, January, May, July, and Sept.
Autolytus incertus, March.
Gattiola finmarchica, September.
Tomopteris onisciformis, June to January.
Larva of *Loxosoma*, April.
Cyphonautes larva, Jan., Feb., June to Dec.
Actinotrocha larva of *Phoronis*, June to August.
Nauplii of Copepoda, throughout the year.
Nauplii of Cirripedia, March and April.
Pupa stage of Cirripedia, March to May.
Evadne nordmanni, June to September.
Podon intermedium, June to September.
Calanus finmarchicus, throughout the year.
Pseudocalanus elongatus, throughout the year.
Acartia clausii, throughout the year.
Oithona spinifrons, throughout the year.
Euterpe gracilis, Jan., Feb, April, and Oct.
Temora longicornis, March to October.

Centropages hamatus, March to September.
Isias clavipes, May, June, and September.
Corycæus anglicus, June and November.
Candacia pectinata, June to August.
Metridia longa, August.
Anomalocera patersoni, October.
Lernæa branchialis, November.
Monstrilla sp., November.
Larva of Bopyrid, December to February.
Zoeas, January to June, August and November.
Megalopas, May to August.
Molluscan veligers, January to April, Sept. to Dec.
Lamellibranch fry, September to February.
Gastropod fry, January to March, July to October.
Tunicata larvæ, Jan., Feb., July, August, and Nov.
Oikopleura, throughout the year.
Fritillaria, October and November.
Fish eggs, February, March, June.
Fish larvæ, February to July.

It will probably be convenient to readers if the EXPLANATION OF THE PLATES is given here rather than at the end of the Report.

PLATE I.

Fig. 1. Planarian worm, Oct. 28th, 1898.
Fig. 2. Trochophore larva, Oct. 28th, 1898.
Fig. 3. Trochophore larva, showing early stage of metameric segmentation, Dec. 17th and 30th, 1898.
Fig. 4. Trochophore-like larva, with three bands of cilia. Pale-green, highly refractive bodies in interior. Dec. 30th, 1898, and Jan. 24th, 1899.
Fig. 5. Unknown larva. Organ *o* is paired, and the granules in the interior vesicle were in active rotation. Jan. 24th, 1899.

Fig. 6. Trochophore larva, Dec. 30th, 1898, and Feb. 3rd, 1899.

Figs. 7 and 8. Post-larval stages of Polychæta, of which many were taken during April, 1899.

Plate II.

Fig. 1. Holothurian larva, Jan. 24th, 1899.

Fig. 2. Echinoderm Blastosphere, at close of segmentation, Dec. 17th, 1898.

Fig. 3. Gastrula stage of fig. 2, in optical section. *a.c.*, Amœboid cells budded from the invagination.

Fig. 4. Asterid Gastrula, Jan. 24th, 1899.

Fig. 5. Later stage of fig. 4, showing the archenteron, *ar.*

Fig. 6. Still later stage, from ventral surface. *ar.*, archenteron, from which the enterocœlic vesicles, *v.p.d.*, are derived. The water vascular rosette is derived, according to Metschnikoff, from the left vesicle, that on right of figure.

Fig. 7. Tornaria larva of *Balanoglossus*, June 5th, 1899.

Fig. 8. Bipinnaria larva, Feb. 23rd, 1899, from dorsal surface. *œ.*, Oesophagus; *a.*, Anus; *hy.*, Hydropore; *v.p.d.*, anterior enterocœlic vesicles.

Figs. 9 and 10. Tornaria larvæ of *Balanoglossus*, June 23rd, 1899. *p.p.*, Proboscis pore; *p.c.*, Proboscis cavity. Figure 10 is most probably identical with the Tornaria figured by Mr. G. C. Bourne (Journ. Mar. Biol. Assoc., vol. I., p. 63, Pl. VIII., fig. 13).

PUBLICATIONS.

During the past year the following papers dealing with biological work in the L.M.B.C. District have been published :—

1. The Twelfth Annual Report (Trans. Biol. Soc., vol. XIII., pp. 21—65), with illustrations, 1898.

2. The Sea-Fisheries Laboratory Report for 1898 (Trans. Biol. Soc., vol. XIII., pp. 69—155, and Plates I. and II). By W. A. Herdman, Andrew Scott and James Johnstone, with additional Articles by R. L. Ascroft, C. A. Kohn, F. W. Gamble and F. W. Keeble, 1899.

3. List of the Araneida of Port Erin and District. By A. R. Jackson (Trans. Biol. Soc., vol. XIII., pp. 66—68), 1899.

4. Note on Mid-Winter Surface and Deep Tow-Nettings in the Irish Sea. By I. C. Thompson (Trans. Biol. Soc., vol. XIII., pp. 156—162), 1899.

5. Lancashire Sea-Fisheries Memoir, No. I. Oysters and Disease. By W. A. Herdman and R. Boyce; pp. 60, and eight Plates; quarto. G. Philip and Sons, London and Liverpool, 1899.

6. L.M.B.C. Memoirs, No. I. Ascidia. By W. A. Herdman; pp. viii. and 60, and five Plates; octavo. Dobb and Co., Liverpool, 1899.

This last item brings us to the consideration of our last new series of publications :—

THE L.M.B.C. MEMOIRS.

It will be remembered that in last year's Report I proposed a scheme for the issue of a series of special Memoirs upon typical British marine plants and animals.

In our twelve years experience of a Biological Station (five years at Puffin Island and seven at Port Erin), where college students and young amateurs formed a large proportion of the workers, the want has been constantly felt of a series of detailed descriptions of the structure of certain common typical animals and plants, chosen as representatives of their groups, and dealt with by specialists. The same want has probably been felt in other similar institutions and in many College laboratories.

The suggestion has been received so cordially that we have been encouraged to carry out the scheme without delay, and the first papers of the series are now being issued. They will be called the "L.M.B.C. Memoirs," each will treat of one type, and they will be issued separately as they are ready, and will be obtainable Memoir by Memoir as they appear, or later bound up in convenient volumes. It is hoped that such a series of special studies, written by those who are thoroughly familiar with the forms of which they treat, will be found of value by students of Biology in our laboratories and in Marine Stations, and will be welcomed by many others working privately at Marine Natural History.

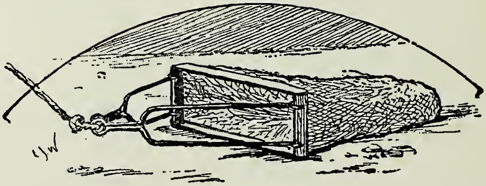
It is proposed that the forms selected, should, as far as possible, be common L.M.B.C. (Irish Sea) animals and plants of which no adequate account already exists in any text-book. Probably most of the specialists who have taken part in the L.M.B.C. work in the past, will prepare accounts of one or more representatives of their groups. The following have already promised their services, and in some cases the Memoir is already far advanced. The first Memoir (No. I., Ascidia) was published in October, price 1s. 6d.; the second (No. II., Cardium) is now in type, and will be issued in a few weeks; the third (No. III., Echinus) will appear before the end of 1899. A couple of Botanical Memoirs will, it is hoped, be ready early in 1900, and others will follow in rapid succession.

The complete list, so far as arranged, is as follows :—

Memoir I. Ascidia, W. A. Herdman, 60 pp., 5 Pl., 1/6.
II. Cardium, J. Johnstone, 92 pp., 7 Pl., 2/-.
III. Echinus, H. C. Chadwick, ... pp., 3 Pl., 1/-.
IV. Codium, R. J. H. Gibson and Helen Auld.
Himanthalia, C. E. Jones.
Peridinian, George Murray & F. G. Whitting.
Alcyonium, S. J. Hickson.
Dendronotus, J. A. Clubb.
Zostera, R. J. Harvey Gibson.
Diatoms, F. E. Weiss.
Gigartina, O. V. Darbishire.
Plaice, F. J. Cole and J. Johnstone.
Cuttle-Fish, W. E. Hoyle.
Ostracod, Andrew Scott.
Botrylloides, W. A. Herdman.
Patella, J. R. Ainsworth Davis.
Calanus, I. C. Thompson.
Actinia, J. A. Clubb.
Bugula, Laura R. Thornely.
Calcareous Sponge, R. Hanitsch.
Porpoise, A. M. Paterson.
Arenicola, J. H. Ashworth.
Oyster, W. A. Herdman and J. T. Jenkins.

I desire now to acknowledge that a generous donation from Mr. F. H. Gossage, of Woolton, has met the expense of preparing the plates in illustration of the first few Memoirs, and so has enabled the Committee to commence the publication of the series sooner than would otherwise have been possible. At the end of last year's Report, after stating my suggestion as to the L.M.B.C. Memoirs, I made an appeal for funds to meet the expense, in the course of which I happened to say:—"Liverpool is the right and natural place for a School of Marine Biology, and I hope that Liverpool will consider that it is creditable to the city that such local researches should be published by a Liverpool Society. An addition of about £100 a year to our funds is necessary in order to enable us to do justice to the work now being produced by our colleagues and students."

Shortly afterwards I received from Mr. F. H. Gossage a most welcome and gratifying letter, enclosing a cheque for £100 to be used at my discretion for the benefit of the Marine Biological work. A part of this kind gift has been devoted to the purchase of much-needed books and instruments, and the remainder is now meeting the expense of the plates in these L.M.B.C. Memoirs.



APPENDIX A.

THE LIVERPOOL MARINE BIOLOGY COMMITTEE (1899).

R. D. DARBISHIRE, Esq., B.A., F.G.S., Manchester.
PROF. R. J. HARVEY GIBSON, M.A., F.L.S., Liverpool.
HIS EXCELLENCY LORD HENNIKER, Governor of the Isle of Man.
PROF. W. A. HERDMAN, D.Sc., F.R.S., F.L.S., Liverpool, Chairman of the L.M.B.C., and Hon. Director of the Biological Station.
W. E. HOYLE, Esq., M.A., Owens College, Manchester.
P. M. C. KERMODE, Esq., Secy. Nat. Hist. Soc., Ramsey, Isle of Man.
A. LEICESTER, Esq., formerly of Liverpool.
SIR JAMES POOLE, J.P., Liverpool.
DR. ISAAC ROBERTS, F.R.S., formerly of Liverpool.
I. C. THOMPSON, Esq., F.L.S., Liverpool, Hon. Treasurer.
A. O. WALKER, Esq., F.L.S., J.P., Maidstone.

CONSTITUTION OF THE L.M.B.C.

(Established March, 1885.)

I.—The OBJECT of the L.M.B.C. is to investigate the Marine Fauna and Flora (and any related subjects such as submarine geology and the physical condition of the water) of Liverpool Bay and the neighbouring parts of the Irish Sea; and, if practicable, to establish and maintain a Biological Station on some convenient part of the coast.

II.—The COMMITTEE shall consist of not more than 12 and not less than 10 members, of whom 3 shall form a quorum; and a meeting shall be called at least once a year for the purpose of arranging the Annual Report, passing the Treasurer's accounts, and transacting any other necessary business.

III.—During the year the AFFAIRS of the Committee shall be conducted by an HON. DIRECTOR, who shall be Chairman of the Committee, and an HON. TREASURER, both of whom shall be appointed at the Annual Meeting and shall be eligible for re-election.

IV.—Any VACANCIES on the Committee, caused by death or resignation, shall be filled by the election at the Annual Meeting, of those who, by their work on the Marine Biology of the district, or by their sympathy with science, seem best fitted to help in advancing the work of the Committee.

V.—The EXPENSES of the investigations, of the publication of results, and of the maintenance of the Biological Station shall be defrayed by the Committee, who, for this purpose, shall ask for subscriptions or donations from the public, and for grants from scientific funds.

VI.—The BIOLOGICAL STATION shall be used primarily for the Exploring work of the Committee, and the SPECIMENS collected shall, so far as is necessary, be placed in the first instance at the disposal of the members of the Committee and other specialists who are reporting upon groups of organisms; work places in the Biological Station may, however, be rented by the week, month, or year to students and others, and duplicate specimens which, in the opinion of the Committee, can be spared may be sold to museums and laboratories.

LIVERPOOL MARINE BIOLOGICAL STATION at PORT ERIN.

Laboratory Regulations.

I.—This Biological Station is under the control of the Liverpool Marine Biological Committee, the executive of which consists of the Hon. Director (Prof. Herdman, F.R.S.) and the Hon. Treasurer (Mr. I. C. Thompson, F.L.S.).

II.—In the absence of the Director, and of all other members of the Committee, the Station is under the temporary control of the Resident Curator or Laboratory Assistant, who will keep the keys, and will decide, in the event of any difficulty, which places are to be occupied by workers, and how the tanks, boats, collecting apparatus, &c., are to be employed.

III.—The Resident Curator will be ready at all reasonable hours and within reasonable limits to give assistance to workers at the Station, and to do his best to supply them with material for their investigations.

IV.—Visitors will be admitted, on payment of a small specified charge, to see the Aquarium and the Station, so long as it is found not to interfere with the scientific work. Occasional lectures are given by members of the Committee.

V.—Those who are entitled to work in the Station, when there is room, and after formal application to the Director, are :—(1) Annual Subscribers of one guinea or upwards to the funds (each guinea subscribed entitling to the use of a work place for three weeks), and (2) others who are not annual subscribers, but who pay the Treasurer 10s. per week for the accommodation and privileges. Institutions, such as Colleges and Museums, may become subscribers in order that a work place may be at the disposal of their staff for a certain period annually; a subscription of two guineas will secure a work place for six weeks in the year, a subscription of five guineas for four months, and a subscription of £10 for the whole year.

VI.—Each worker* is entitled to a work place opposite a window in the Laboratory, and may make use of the microscopes, reagents, and other apparatus, and of the boats, dredges, tow-nets, &c., so far as is compatible with the claims of other workers, and with the routine work of the Station.

VII.—Each worker will be allowed to use one pint of methylated spirit per week free. Any further amount required must be paid for. All dishes, jars, bottles, tubes, and other glass may be used freely, but must not be taken away from the Laboratory. Workers desirous of making, preserving, or taking away collections of marine animals and plants, can make special arrangements with the Director or Treasurer in regard to bottles and preservatives. Although workers in the Station are free to make their own collections at Port Erin, it must be clearly understood that (as in other Biological Stations) no specimens must be taken for such purposes from the Laboratory stock, nor from the Aquarium tanks, nor from the steam-boat dredging expeditions, as these specimens are the property of the Committee. The specimens in the Laboratory stock are preserved for sale, the animals in the tanks are for the instruction of visitors to the Aquarium, and as all the expenses of steam-boat dredging expeditions are defrayed by the Committee, the specimens obtained on these occasions must be retained by the

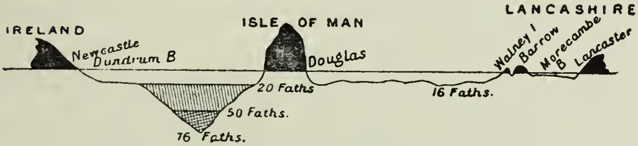
---

* Workers at the Station can always find comfortable and convenient quarters at the closely adjacent Bellevue Hotel; but lodgings can readily be had by those who prefer them.

Committee (*a*) for the use of the specialists working at the Fauna of Liverpool Bay, (*b*) to replenish the tanks, and (*c*) to add to the stock of duplicate animals for sale from the Laboratory.

VIII.—Each worker at the Station is expected to lay a paper on some of his results—or at least a short report upon his work—before the Biological Society of Liverpool during the current or the following session.

IX.—All subscriptions, payments, and other communications relating to finance, should be sent to the Hon. Treasurer, Mr. I. C. Thompson, F.L.S., 53, Croxteth Road, Liverpool. Applications for permission to work at the Station, or for specimens, or any communication in regard to the scientific work should be made to Professor Herdman, F.R.S., University College, Liverpool.



Diagrammatic Section Across the Irish Sea.

Appendix B.

HON. TREASURER'S STATEMENT.

From the balance sheet appended it will be seen that the year again ends with a small debit balance, although all due economy has been observed, consistent with efficiency.

The British Association (1896) fund has, to a considerable extent, enabled the Committee to continue the extra expense involved in securing the services of a competent Resident Curator at the Port Erin Station, which has already proved of marked benefit to workers and students, the number of whom have thereby considerably increased.

The appeal made by the Director in his last year's Report for an additional income of about £100 per annum, to be utilised in publishing well-illustrated papers and memoirs, embodying the results of local biological investigations, has been responded to by Mr. Gossage by a donation for the present year. This fund is being separately applied for the publication of a valuable series of well-illustrated Biological Memoirs now appearing, the accounts of which will be published later.

The Hon. Treasurer will be glad to receive the names of new subscribers, with the view of continuing these publications, and further adding very materially to the already excellent work achieved under the auspieces of the L.M.B.C. since its foundation, fifteen years ago.

SUBSCRIPTIONS and DONATIONS.

	Subscriptions.			Donations.		
	£	s.	d.	£	s.	d.
Ayre, John W., Ripponden, Halifax ...	1	1	0		—	
Bateson, Alfred, Harrop-road Bowdon ...	1	1	0		—	
Beaumont, W. I., Cambridge	1	1	0		—	
Bickerton, Dr., 88, Rodney-street ...	1	1	0		—	
Bickersteth, Dr., 2, Rodney-st.	2	2	0		—	
Brown, Prof. J. Campbell, Univ. Coll. ...	1	1	0		—	
Browne, Edward T., B.A., 141, Uxbridge-road, Shepherd's Bush, London ...	1	1	0		—	
Brunner, Sir J. T., Bart., M.P., L'pool.	5	0	0		—	
Boyce, Prof., University College ...	1	1	0		—	
Buckley, W., Hulme, Manchester	0	10	0		—	
Caton, Dr., 86, Rodney-street		—		1	1	0
Clague, Dr., Castletown, Isle of Man ...	1	1	0		—	
Clubb, J. A., Public Museums, Liverpool	0	10	6		—	
Cole, F. J., (research table)	1	1	0		—	
Coombe, John N., 4, Paradise-sq., Sheffield	1	1	0		—	
Comber, Thomas, J.P., Leighton, Parkgate	1	1	0		—	
Corker, J., Moss Side, Manchester ...	0	10	0		—	
Crellin, John C., J.P., Andreas, I. of Man	0	10	6		—	
Crossland, Cyril, Clare College, Cambridge	2	10	0			
Dickinson, Dr., 8, Croxteth-rd., Liverpool		—		2	2	0
Gair, H. W., Smithdown-rd., Wavertree	2	2	0		—	
Gamble, Col. C.B., Windlehurst, St. Helens	2	0	0		—	
Gamble, F. W., Owens College, Manchester	1	1	0		—	
Gaskell, Frank, Woolton Wood	1	1	0		—	
Gaskell, Holbrook, J.P., Woolton Wood	1	1	0		—	
Gibson, Prof. R. J. Harvey, Waterloo ...	1	1	0		—	
Gotch, Prof., Museum, Oxford	1	1	0		—	
Forward ...	£32	11	0	3	3	0

	Subscriptions.			Donations.		
	£	s.	d.	£	s.	d.
Forward ...	32	11	0	3	3	0
Halls, W. J., 35, Lord-street	1	1	0		—	
Hanitsch, Dr., Museum, Singapore ...	1	1	0		—	
Harmer, F. W., Cringleford, Norwich ...	1	1	0		—	
Harrison, H. S., Univ. Coll., Cardiff ...	0	10	0		—	
Henderson, W. G., Liverpool Union Bank	1	1	0		—	
Herdman, Prof., University College ...	2	2	0		—	
Hewitt, David B., J.P., Northwich ...	1	1	0		—	
Holland, Walter, Mossley Hill-road ...	2	2	0		—	
Holt, Alfred, Crofton, Aigburth	2	2	0		—	
Holt, Mrs. George, Sudley, Mossley Hill	1	0	0		—	
Holt, R. D., 54, Ullet-road, Liverpool ...	2	0	0		—	
Hoyle, W. E., Museum, Owens College	1	1	0		—	
Isle of Man Natural History Society ...	1	1	0		—	
Jarmay, Gustav, Hartford	1	1	0		—	
Jenkins, J. T., Univ. Coll., Liverpool ...	3	10	0		—	
Jones, C. W., J.P., Field House, Wavertree	1	0	0		—	
Kermode, P. M. C., Hill-side, Ramsey ...	1	1	0		—	
Lea, Rev. T. Simcox, 3, Wellington-fields	1	1	0		—	
Leicester, Alfred, Aston Clinton, Bucks ...	1	1	0		—	
Macfie, Robert, Airds	1	0	0		—	
Mackay, J. R., Longsight, Manchester ...	1	1	0		—	
Meade-King, H. W., J.P., Sandfield Park	1	1	0		—	
Meade-King, R. R., 4, Oldhall-street ...	0	10	0		—	
Melly, W. R., 90, Chatham-street ...	1	1	0		—	
Monks, F. W., Brooklands, Warrington	1	1	0		—	
Muspratt, E. K., Seaforth Hall	5	0	0		—	
Newton, John, M.R.C.S., 44, Rodney-st.	0	10	6		—	
Okell, Robert, B.A., Sutton, Douglas ...	1	1	0		—	
Paterson, Prof., University College ...	1	1	0		—	
Poole, Sir James, Liverpool	2	2	0		—	
Rathbone, Mrs. Theo., Backwood, Neston	1	1	0		—	
Forward ...	£74	17	6	3	3	0

	Subscriptions.			Donations.		
	£	s.	d.	£	s.	d.
Forward ...	74	17	6	3	3	0
Rathbone, Miss May, Backwood, Neston	1	1	0	2	2	0
Rathbone, W., Greenbank	2	2	0		—	
Roberts, Isaac, F.R.S., Crowborough ...	1	1	0		—	
Schuster, E. H., New College, Oxford ...	2	10	0		—	
Simon, R., Broughton, Manchester ...	0	10	0		—	
Simpson, J. Hope, Annandale, Aigburth-dr	1	1	0		—	
Smith, A. T., junr., 24, King-street ...	1	1	0		—	
Sollas, Miss, Oxford	1	1	0		—	
Talbot, Rev. T. U., Douglas, I. of Man...	1	1	0		—	
Thompson, Isaac C., 53, Croxteth-road	2	2	0		—	
Thornely, The Misses, Aigburth-Hall-Rd.	1	1	0		—	
Timmis, T. Sutton, Cleveley, Allerton ...	2	2	0		—	
Toll, J. M., Kirby Park, Kirby	1	1	0		—	
Torrance, Gilbert, North Quay, Douglas	1	1	0		—	
Walker, A. O., Maidstone	3	3	0		—	
Walker, Horace, South Lodge, Princes-pk.	1	1	0		—	
Walters, Rev. Frank, B.A., the late ...	1	1	0		—	
Watson, A. T., Tapton-crescent, Sheffield	1	1	0		—	
Weiss, Prof. F. E., Owen's College, Man'tr.	1	1	0		—	
Westminster, Duke of, Eaton Hall ...	5	0	0		—	
Wiglesworth, Dr., Rainhill	1	1	0		—	
Yates, Harry, 75, Shude-hill, Manchester	1	11	0		—	
	£108	11	6	5	5	0

SUBSCRIPTIONS FOR THE HIRE OF COLLEGE "WORK-TABLES."

Owens College, Manchester	£10	0	0
University College, Liverpool	10	0	0
	£20	0	0

THE LIVERPOOL MARINE BIOLOGY COMMITTEE.

Dr. In Account with ISAAC C. THOMPSON, Hon. Treasurer. **Cr.**

1899.	£	s.	d.
To Balance due Treasurer, Dec. 31st, 1898	6	8	3
,, Printing Reports and Engraving Plates	17	7	9
,, Printing and Stationery	0	12	6
,, Expenses of Dredging Expeditions	26	13	8
,, Boat Hire	1	16	9
,, Books and Apparatus at Port Erin Biological Station	21	3	1
,, Postage, Carriage of Specimens, &c.	4	6	3
,, Salary, Curator	90	0	0
,, Rent of Port Erin Biological Station	15	0	0
,, New Shellbend Boat	9	0	0
,, Sundries	2	5	5
	£194	13	8

1899.	£	s.	d.
By Subscriptions and Donations received	114	17	6
,, Amount received from Colleges, &c., for hire of "Work Tables"	20	0	0
,, Dividend, British Workman's Public House Co., Ltd., Shares	7	8	6
,, Sale of Nat. Hist. Specimens	2	7	8
,, Sale of Reports and Volumes of Fauna	5	3	1
,, Interest on British Association (1896) Fund	38	13	4
,, Bank Interest	0	3	3
,, Admissions to Aquarium	3	16	6
,, Balance due Treasurer, Dec. 31st, 1899	2	3	10
	£194	13	8

Endowment Investment Fund :—
British Workmans' Public House Co's. shares £173 1 0

ISAAC C. THOMPSON,
Hon. Treasurer.

Audited and found correct,
A. T. SMITH, Junr.

Liverpool, *December* 31*st*, 1899.

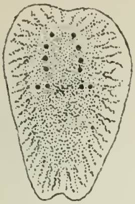


Fig. 1.

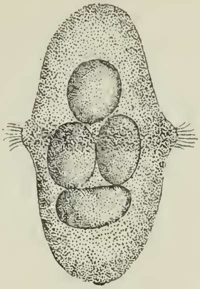


Fig. 2.

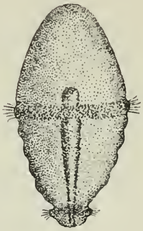


Fig. 3.

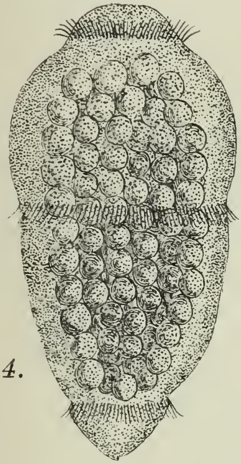


Fig. 4.

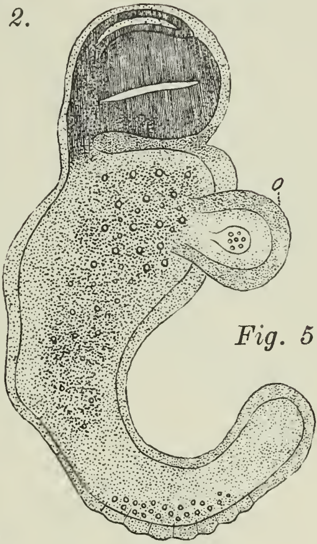
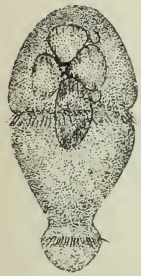


Fig. 5.

Fig. 6.



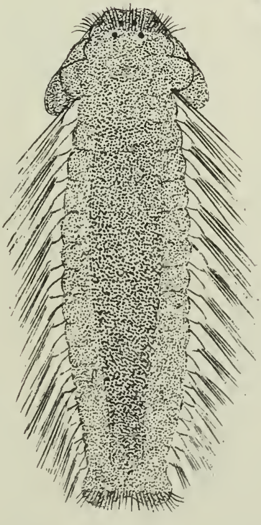


Fig. 7.

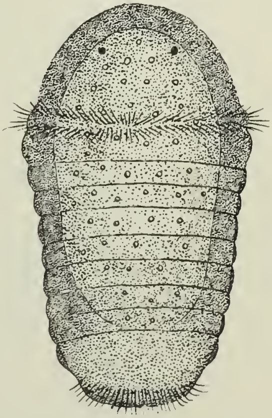


Fig. 8.

100ths of an inch.

Scale for figs. 1 to 3 & 6 to 8.

100th. of an inch.

Scale for figs. 4 & 5.

H.C.C. del.

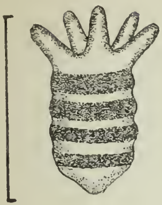


Fig. 1.

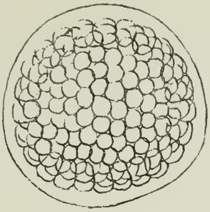


Fig. 2.

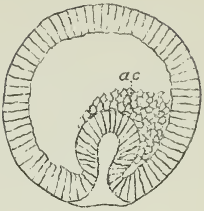


Fig. 3.

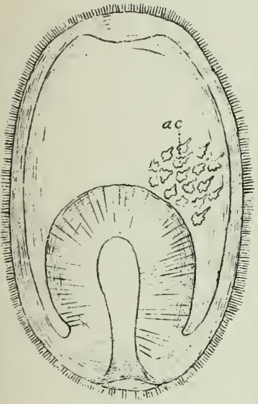


Fig. 4.

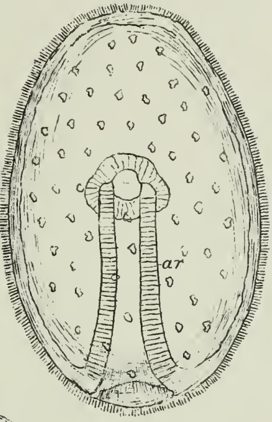


Fig. 5.

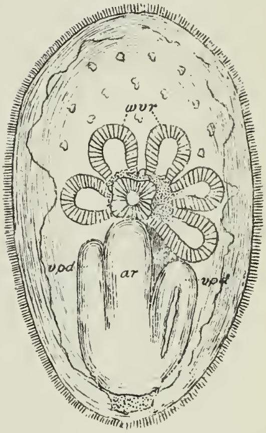


Fig. 6.

Scale for figs. 4,5 & 6.
100th of an inch.

Scale for figs 2,3,7 & 8.
100th of an inch.

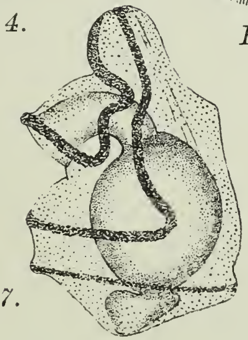


Fig. 7.

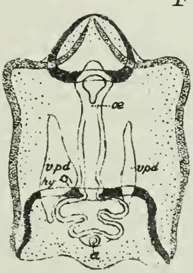


Fig. 8.

Scale for figs. 9 & 10.
100ths of an inch

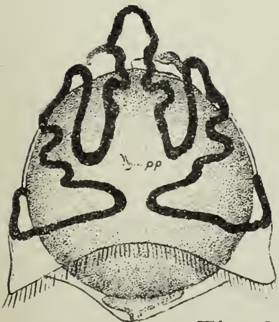


Fig. 9.

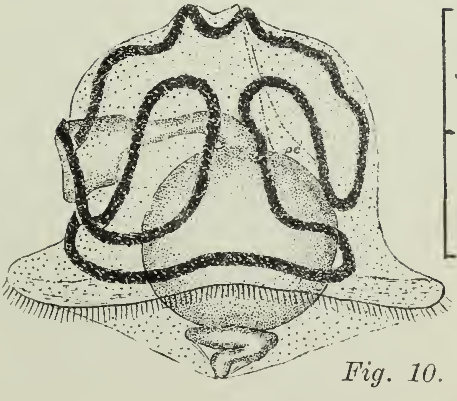


Fig. 10.

H.C.C. del.

UNIVERSITY OF ILLINOIS-URBANA
3 0112 110951271

L.M.B.C. NOT

The public are admitted by ticket to inspect the Aquarium at suitable hours daily, when the Curator will be, as far as possible, in attendance to give information. Tickets of admission, price threepence each, to be obtained at the Biological Station or at the Bellevue Hotel. The various tanks are intended to be illustrative of the marine life of the Isle of Man. It is intended also that short lectures on the subject should be given from time to time.

Applications to be allowed to work at the Biological Station, or for specimens (living or preserved) for Museums, Laboratory work, and Aquaria, should be addressed to Prof. Herdman, F.R.S., University College, Liverpool.

Subscriptions and donations should be sent to Mr. I. C. Thompson, F.L.S., 53, Croxteth Road, Liverpool.

The surplus copies of the five Annual Reports upon the Marine Biological Station formerly on Puffin Island (1881 to 1892, the complete set) have been collated and bound up to form an 8vo. volume of about 180 pages, illustrated with cuts and plates, and containing the original lithographed covers. There are 20 copies of this vol., which are now offered by the Committee at 3/- each nett.

Copies of the Annual Reports from 1893 onwards, can also be had, price sixpence each (all post free).

The L.M.B. Committee are publishing their Reports upon the Fauna and Flora of Liverpool Bay in a series of 8vo. volumes at intervals of about three years. Of these there have appeared :—

Vol. I. (372 pp., 12 plates), 1886, price 8/6.
Vol. II. (240 pp., 12 plates), 1889, price 7/6.
Vol. III. (400 pp., 24 plates), 1892, price 10/6.
Vol. IV. (475 pp., 53 plates), 1895, price 10/6.

Of the L.M.B.C. Memoirs the following are ready :—

No. I. Ascidia, 60 pp. and 5 Pls., price 1/6.
No. II. Cardium, 90 pp. and 7 Pls., price 2/-.
No. III. Echinus, ... pp. and 3 Pls., price 1/-.

Copies of any of the above publications may be ordered from the Liverpool Marine Biology Committee, University College, Liverpool, or from the Hon. Treas., 53, Croxteth Road, Liverpool.

Isaac C. Thompson,
Hon. Treas.